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Radiation and contrast free catheter-directed thrombolysis for early pregnancy-related massive iliocaval deep vein thrombosis

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Abstract

Catheter-directed thrombolysis (CDT) for iliofemoral deep vein thrombosis (DVT) aims at reducing acute leg symptoms and at preventing the incidence of the postthrombotic syndrome. There are no data from controlled trials in pregnant patients. Reports of thrombolysis treating DVT during pregnancy are scarce. Pregnancy is considered a relative

contraindication to thrombolytic therapy because of the risk of bleeding and concerns about the effects of radiation exposure on the fetus. We report on a CDT procedure without radiation and contrast exposure in a first trimester pregnant patient with massive iliofemoral DVT and free-floating thrombus extending to the suprarenal inferior vena cava.

Deep vein thrombosis (DVT) is a major complication that occurs in 1.36 per 1000 pregnancies, with pulmonary embolism (PE) being a leading cause of maternal morbidity in developing countries (1).

Anticoagulation therapy, the current standard of care for deep vein thrombosis, inhibits thrombus propagation and provides prophylaxis against pulmonary embolism (2). Iliofemoral DVT is associated with a high risk of post-thrombotic syndrome (PTS) (3, 4). Treating DVT in pregnancy with anticoagulation alone results in a high rate of post-thrombotic morbidity and impaired quality of life in this group of young and otherwise healthy patients. In a study of 104 women with pregnancy-related thrombosis, only 22% reported freedom of postthrombotic symptoms after a median follow up time of 11 years. (5).

Due to the bleeding risk of systemic lysis and the high risk of rethrombosis after surgical procedures, catheter-directed thrombolysis for iliofemoral DVT has been established for selected patients with good functional status and a low risk of bleeding (6). Administering rt-PA directly into the venous clot allows for a significant dose reduction compared to systemic thrombolysis (7).

In one randomized trial, CDT improved clinically relevant long-term outcome after iliofemoral DVT by reducing PTS compared to conventional treatment with anticoagulation and compression stockings alone (7). In another trial (ATTRACT), the incidence of the PTS was not reduced by CDT, most likely because almost half of the patients had proximal DVT without involvement of the iliac veins (8).

There are concerns about the effects of radiation exposure on proliferating maternal breast tissue and on the fetus during pregnancy, particularly during organogenesis in the first trimester. We report on a CDT procedure without radiation and contrast exposure in a first trimester pregnant patient with massive thrombus extending from the proximal part of the left common femoral vein to the suprarenal inferior vena cava without involvement of the renal veins.

The patient provided written informed consent to the publication.

Case report

A 29-year-old woman at 11 2/7 weeks of gestation was referred to our clinic due to sudden massive, painful swelling of the left lower extremity with inability to walk. Ultrasound revealed a complete obstruction of the left common femoral and iliac veins with extension of a free-floating thrombus into the suprarenal inferior vena cava (IVC) (Fig. 1).

On admission, an intravenous bolus of 5,000 I.U. of unfractionated heparine (UFH) was given, followed by continuous intravenous infusion of UFH, adjusted to maintain an activated partial thromboplastine time (aPTT) between 46 and 70 sec.

The hypercoagulability evaluation was negative for antiphospholipid antibody syndrome, factor V-Leiden-mutation and prothrombin gene variant. Protein C, protein S, and antithrombin-III levels were normal.

After 24 hours of heparin treatment, no improvement of the clinical status was seen. Serial ultrasound examination revealed persistence of the free-floating suprarenal IVC thrombus. Implantation of an inferior vena cava filter was deemed technically not feasible because of the close proximity of the thrombus to the right atrium.

To avoid a fatal pulmonary embolism and to reduce acute leg symptoms we decided to perform catheter-directed thrombolysis, inserting the thrombolysis-catheter under ultrasound guidance to avoid radiation and contrast exposure. We preferred CDT over

pharmacomechanical thrombectomy to minimize the risk of embolization of the free-floating IVC thrombus with mechanical maneuvers.

The insertion of the thrombolysis catheter was performed with heart surgery stand by. Venous access was obtained in the non-obstructed femoral vein at the proximal thigh by ultrasound guidance with the patient in supine position. After insertion of a 6-F sheath, a 0.035 inch hydrophilic guidewire (Terumo Corporation, Tokyo, Japan) and a standard angiographic 4-F diagnostic catheter (Berenstein, Cordis, Milpatis, CA) were used to pass the thrombus. Ultrasound guidance was performed with B-mode ultrasound using a 6 MHz sector ultrasound probe tracking the inserted catheter material in the iliofemoral veins and inferior vena cava using longitudinal and transverse views (Fig. 2). The angiographic catheter was then exchanged for the drug delivery catheter with a 30 cm treatment zone corresponding to the length of the thrombotic occlusion (EKOS Corporation; Bothell, WA). Finally the guidewire was replaced by the MicroSonic Device (MSD, EKOS Corporation; Bothell, WA) that contains multiple small, radiopaque ultrasound transducers distributed along the treatment zone to deliver high-frequency (2.2 MHz) and low-power (0.5 Watt per transducer) ultrasound.

After introduction of the thrombolysis catheter the patient was transferred to the intermediate care unit and the thrombolysis infusion was started with rt-PA (Actilyse, Boehringer Ingelheim, Ingelheim, Germany) at a rate of 2mg/h for the first 5 hours, then reduced to 1mg/h over 10 hours. Unfractionated heparin infusion was administered and adjusted every 6 hours to achieve and maintain an aPTT corresponding to therapeutic heparin levels.

Intermittent pneumatic compression of the whole left leg was used to enhance the thrombolysis success.

After 15h of treatment, ultrasound confirmed complete thrombus resolution in the left iliofemoral vein as well as in the inferior vena cava (Fig. 3).

After restoration of blood flow in the iliac veins, presence of a May Thurner syndrome was confirmed (Fig. 4).

Anticoagulation with intravenous heparin was switched to low-molecular heparin (LMWH) subcutaneously. An obstetric exam with ultrasound confirmed normal vital gestation and the patient was discharged the same day.

At 37 5/7 week of gestation, the patient delivered a healthy boy by caesarian section.

Three month after delivery, the patient was scheduld for the stent placement procedure. A venography and IVUS confirmed the presence of a compressed left common iliac vein which was treated by placing an oblique hybrid stent (Sinus Obliquus 16x100 mm, Optimed, Germany).

Discussion

We report on a CDT procedure without radiation and contrast medium exposure in a first-trimester pregnant patient with massive iliofemoral DVT and free-floating thrombus extending to the suprarenal inferior vena cava. Our patient had no evidence of thrombophilia and the reason for her extensive DVT was most likely ascending and descending thrombus propagation from the compressed left common iliac vein (May Thurner syndrome). The main reason for the choosen treatment was to prevent fatal pulmonary embolism of the large IVC thrombus. Placement of an IVC filter would have been an option if the suprarenal IVC were free of thrombus. Following successful thrombolysis, we postponed stent placement to completion of the postpartum period to avoid radiation and contrast exposure. We believe that percutaneous B-mode ultrasound guidance is not precise enough to accurately detect stent landing zones in the iliac veins. The second principal reason for our invasive approach was the prevention of post-thrombotic morbidity. DVT is a common pregnancy-related complication, with significant morbidity and risk of PTS in patients with iliofemoral DVT. Most cases occur in the second and third trimester. Iliofemoral DVT in the first trimester is rather unusual. Most

physicians and guidelines recommend treating pregnancy-related iliofemoral DVT with anticoagulation alone (6). In treating iliofemoral thrombosis, CDT techniques have demonstrated good results in the non-pregnant population (7,9,10,11,12). The main advantage of a catheter-based approach is to increase venous patency and preserve venous valve function, with minimal risk of bleeding complications, and to provide endovascular access for adjunctive therapeutic techniques such as balloon angioplasty and stent placement (13).

The first report of successful use of CDT in pregnancy was published in 1999, describing three mid-gestation patients, one with massive pulmonary embolism and two patients with extensive proximal DVT. Thrombolytic therapy provided rapid resolution of symptoms and no adverse fetal outcomes were observed (14).

A report of 11 pregnant patients undergoing CDT and/or pharmacomechanical catheter-directed thrombolysis (PCDT) is the largest series to date (15). This study suggested a good safety profile with excellent short- and midterm results. However, the authors did not address the potential risks to the fetus associated with the radiation exposure. Radiation exposure in the first trimester may cause fetal death (16, 17). The fetal radiation dose resulting from catheter-directed thrombolysis in the first trimester can be calculated in the range of 175-245 mGy, which is associated with a childhood cancer risk of 1.3%-2%. This value is 6 to 10 times higher than the risk associated with environmental/background radiation exposure (18).

Because of the potential risks of the fetal radiation exposure another case report described elective termination of pregnancies following CDT in the first trimester (18). This approach was however not acceptable for our patient.

Conclusion

Iliofemoral DVT in pregnant women raises a unique therapeutic challenge. In our case, we performed a successful CDT procedure in a pregnant woman in the first trimester without

complications. To prevent radiation exposure the placement of the lysis catheter was realized with ultrasound guidance. Further trial or registry experience is needed to demonstrate the efficacy and safety of this therapeutic approach.

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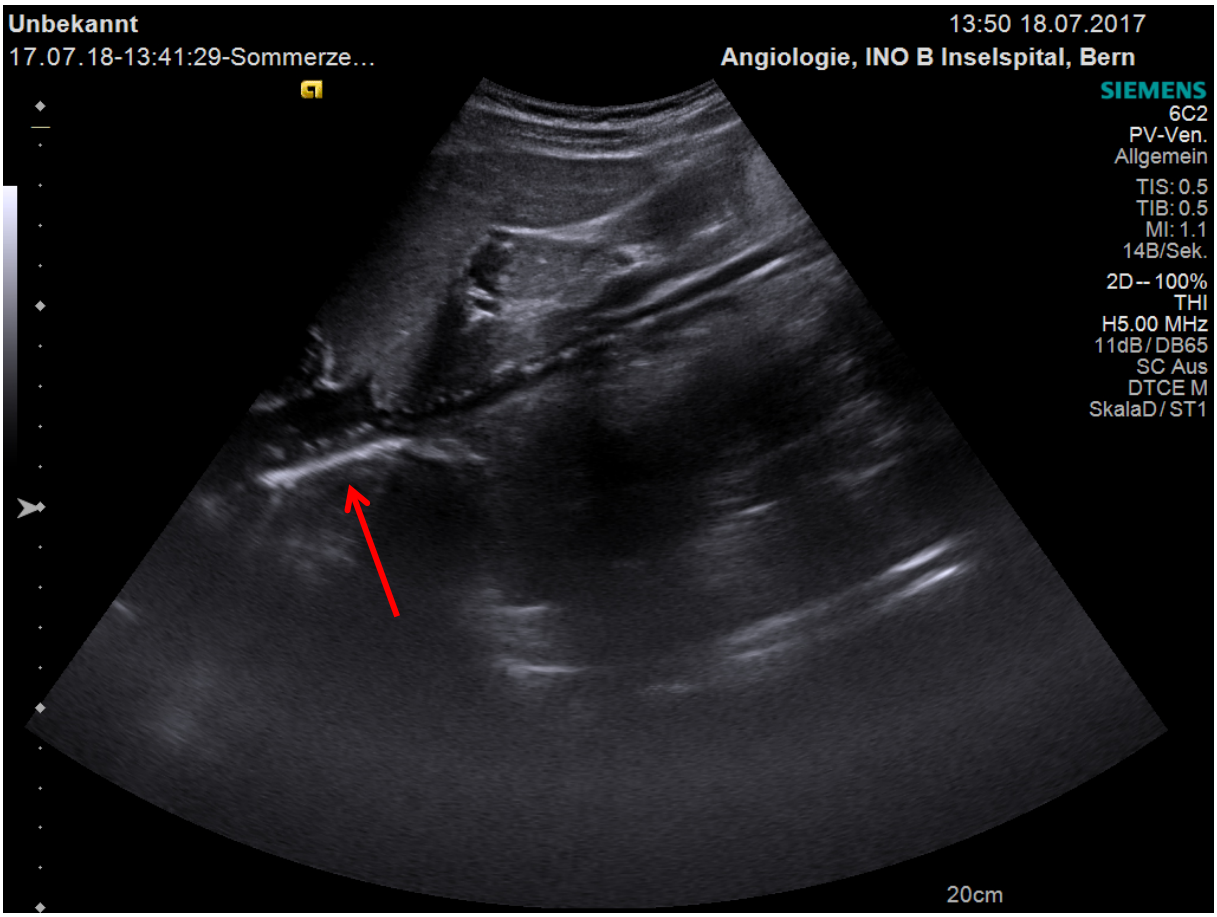
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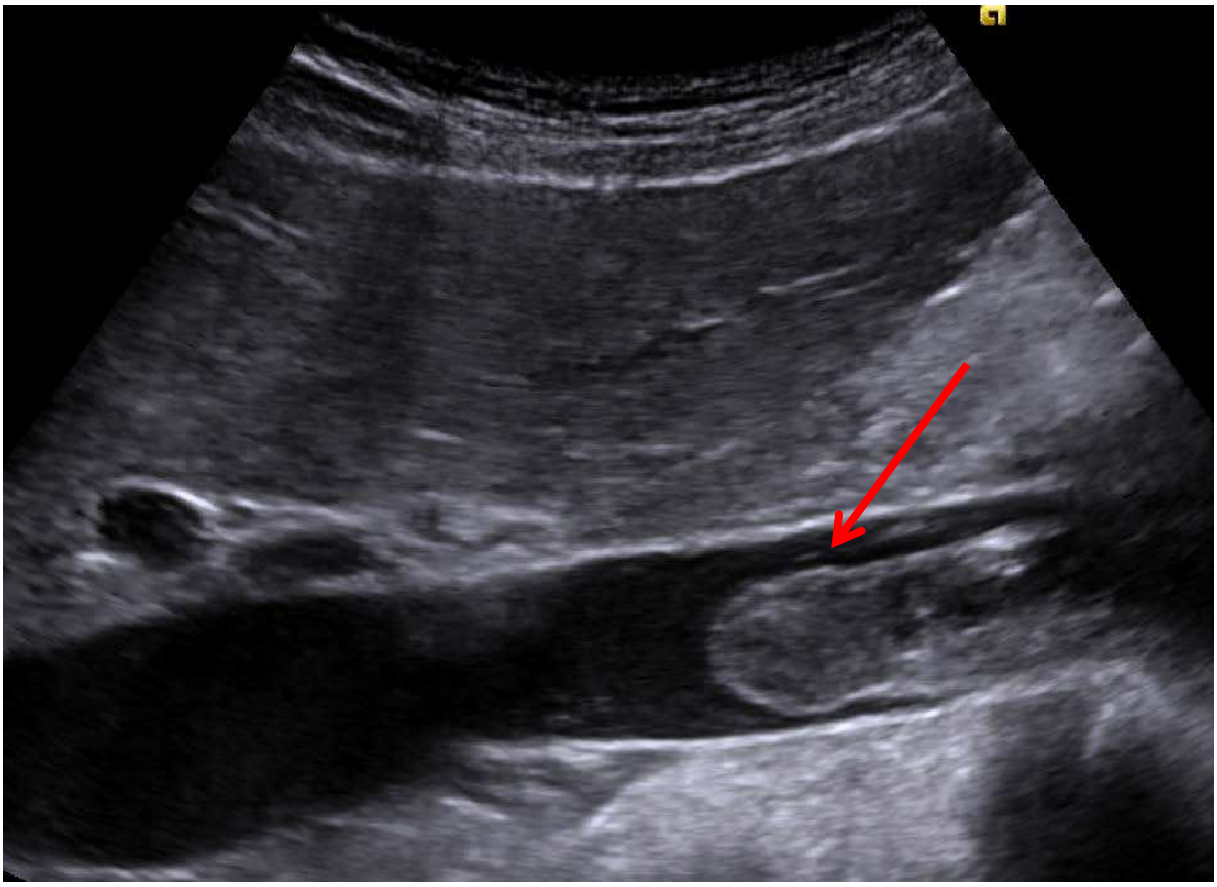


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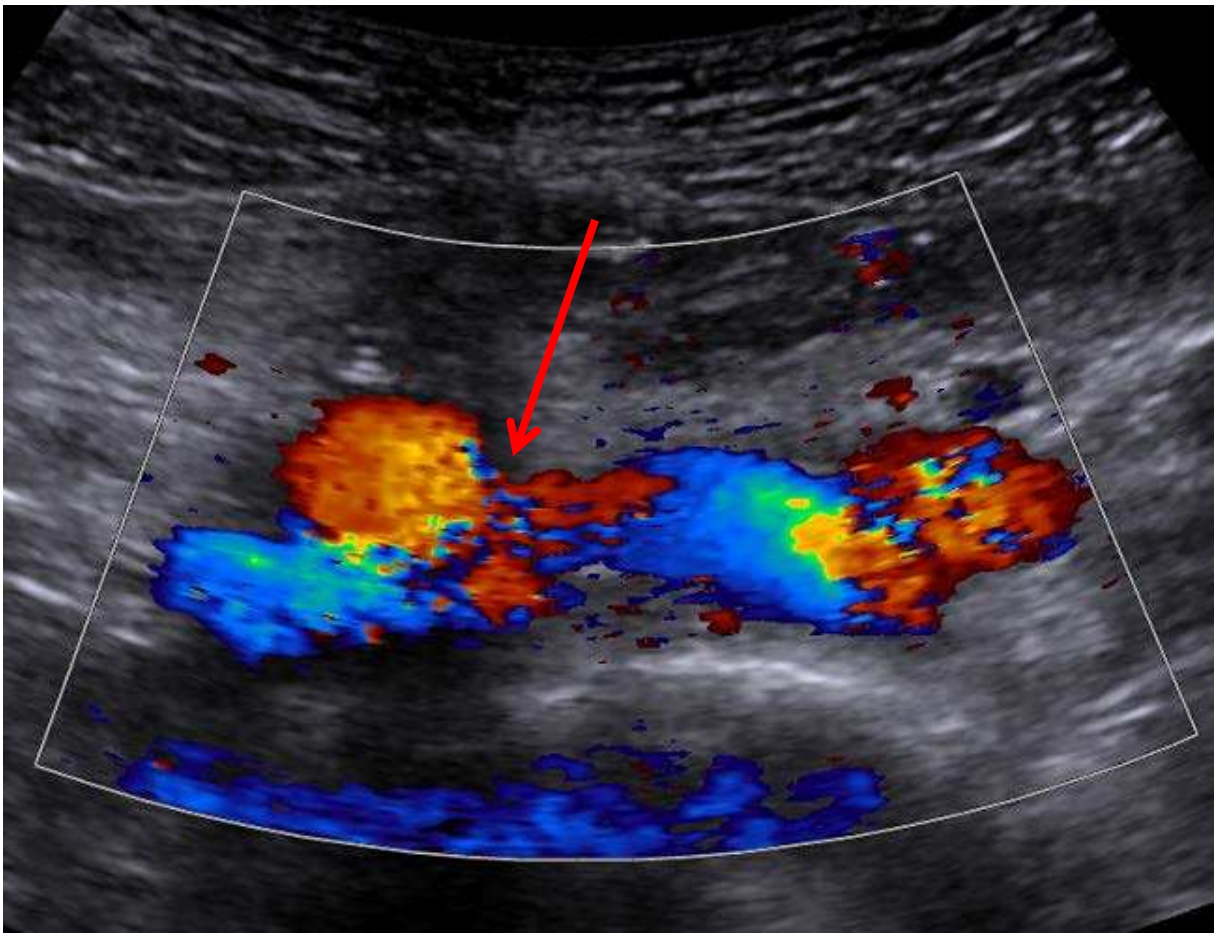

The patient provided written informed consent to the publication.

Fig. 1 Free-floating thrombus in the suprarenal inferior vena cava (arrow, longitudinal view)

Fig. 2 Ultrasound guidance while advancing the catheter material through the thrombotic occlusion of the iliocaval veins (arrow: tip of 5 French EKOS catheter in suprarenal inferior vena cava, longitudinal view)

Fig. 3 Suprarenal inferior vena cava after CDT with complete thrombolysis success (longitudinal view)

Fig. 4 Compression of the left common iliac vein by the right common iliac artery (arrow)